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Socio-Economic Series

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## THREE STUDIES ON MUNICIPAL INFRASTRUCTURE: ALTERNATIVE FINANCING METHODS, DEMAND MANAGEMENT AND PUBLIC-PRIVATE PARTNERSHIPS

### Introduction

Adequate, efficient and well-maintained municipal infrastructure is one of the key components of a viable, prosperous economy, and a significant determinant of quality of life. As competition for scarce resources at all levels of government increases, infrastructure upgrades and expansion are becoming increasingly difficult to finance.

### Research Program

To assist municipalities to address the challenges which they must confront, Canada Mortgage and Housing Corporation (CMHC) has published three studies:

- *Alternative Methods of Financing Municipal Infrastructure*
- *Provision of Municipal Infrastructure Through Demand Management: Guidebook and Case Studies*
- *Public-Private Partnerships in Municipal Infrastructure*

*Alternative Methods of Financing Municipal Infrastructure* is intended to serve as a backgrounder for the other two studies. It looks at infrastructure finance generally - the evolution of the issues, the challenges facing municipalities, and different financing methods. The paper evaluates infrastructure financing mechanisms that are alternative or supplementary to government financing.

*Provision of Municipal Infrastructure Through Demand Management: Guidebook and Case Studies* looks at the ability of demand management (DM) measures to contribute to meeting future water and wastewater infrastructure demands. DM deviates from traditional water and wastewater system planning by focusing on why demand peaks occur and how to reduce them. DM aims at shaping demand, as a precursor to meeting it.

The study describes DM techniques, identifies how to tailor programs to community needs, and introduces tools for planners, engineers, and administrators to reduce water use and wastewater flow by reducing leaks, inflow and infiltration. The guidebook discusses the engineering considerations of water and wastewater conveyance

and treatment systems which assist in ensuring that public health and the environment are protected. It provides a balanced perspective of DM considering risks, effectiveness, and costs. Case studies profile DM initiatives in communities in Ontario, Saskatchewan, Alberta and British Columbia.

*Public-Private Partnerships in Municipal Infrastructure* explores the potential for public-private partnerships to fund the provision, operation and maintenance of municipal infrastructure and examines the impacts on service quality and costs to existing and new homeowners. It discusses the strengths and weaknesses of different partnership models and presents case studies that shed light on which models are appropriate to what conditions.

### Findings

*Alternative Methods of Financing Municipal Infrastructure* identifies a large expenditure gap, in the tens of billions of dollars, related to both upkeep of existing facilities and new requirements. It concludes that different infrastructure financing mechanisms are not necessarily substitutes for one another: some are more appropriate for certain types of facilities than others. The mechanisms considered score differently against various criteria (see table).





**Table 1:**  
**Summary evaluation of infrastructure financing instruments**

Instruments	Evaluation Criteria						
	efficiency	current equity	intergenerational equity	effectiveness	environmental sensitivity	innovation	housing affordability
Development charges	xx	x	x	xx	xx	xx	x
Special district	xx	xx	xx	xx	xx	xx	xx
User Fees							
Marginal cost	xxx	x	xx	xx	xxx	x	xx
Increasing block	xxx	xxx	xxx	xxx	xxx	xx	xx
Decreasing block	x	x	xx	u	x	x	xxx
Two-part tariff	xx	xx	xx	xx	xx	xx	xx
Bond Financing							
General bonds	x	xx	xx	xxx	xx	x	xx
Tax-exempt bonds	x	xx	xx	xxx	xx	x	xxx
Revenue bonds	xx	xx	xx	xxx	xx	xx	xx
Public lease revenue bonds	xx	xx	xx	xx	xx	xx	xx
Bond banks	x	xx	xx	xx	xx	xx	xx
Funds							
Trust funds	xx	xx	xx	xxx	xx	xx	xx
Revolving loan funds	u	u	u	xx	xxx	xx	u
Privatization							
Pure privatization	xxx	xx	xx	xx	xx	xxx	xx
PPP	xx	xx	xx	xx	xx	xx	xx

x - limited opportunity, xx - moderate opportunity, xxx - good opportunity, u - uncertain. Source: Informetrica, 1992.

*Provision of Municipal Infrastructure Through Demand Management: Guidebook and Case Studies* concluded that planners, engineers and administrators need to look at the community being planned for in terms of its history (age of the system, materials used, water/wastewater practices), use (residential; industrial-commercial-institutional; leakage), and future requirements (growth, changing standards). DM programs need to be aligned with the community's history, objectives, capabilities, and environment.

By their nature, water and wastewater infrastructure projects are long-term. They result in permanent capital assets that affect many people and economic activities. The risks inherent in long-term planning must be managed carefully since the stakes are high.

The study found that the highest priority for DM is to reduce peak water demand and wastewater flow, for the following reasons:

- water treatment plants will not be stressed during peak demand periods and water withdrawal will be more sustainable if supply coming from groundwater or storage capacity (e.g., reservoir) is limited;

- wastewater treatment plant bypasses during wet weather will be reduced or eliminated;
- while DM may not be able to significantly reduce the scale of new water and wastewater treatment plants or conveyance systems, in some cases it is capable of deferring the need for treatment storage capacity expansions.

Reducing average water demand and wastewater flow can provide the following benefits:

- wastewater treatment plants will do a better job of treating sewage, and will produce better effluent;
- groundwater supplies will be protected, which may help to maintain flow in wetlands and streams;
- some small savings in operations and maintenance may be achieved.

The literature review and case studies suggest that DM programs are rarely initiated to address wastewater systems. Rather, they generally focus on achieving water demand reductions. By focusing exclusively on the water side, opportunities to achieve environmental gains through better management of wastewater flows may be overlooked.



An approach that integrates water and wastewater objectives is preferred.

In growing communities, the life of facilities may be able to be extended through DM. In slow to no growth communities, wastewater treatment effectiveness will be improved. DM measures can be implemented individually, or by combining measures which are mutually reinforcing. Savings are difficult to predict, however; and a commitment to monitoring and evaluation is needed to allow for review along the way.

*Public-Private Partnerships in Municipal Infrastructure* concludes, based on a series of case studies, that partnerships result in lower municipal costs where operations have economies of scale (Sainte-Marie-de-Beauce water treatment case study) or where the private sector operator can bring to bear its experience and expertise (Ottawa-Carleton sewage treatment system).

Partnerships can affect the purchase price of housing, as well as operating costs (through property taxes). The use of development charges or upfront negotiated solutions tends to increase initial house prices and reduce operating costs through lower taxes. Where a facility is privately built and publicly leased, capital costs (and house prices) may be lower, but operating costs (taxes) will be higher. The private operation of existing facilities will reduce ongoing costs while leaving capital costs unaffected. Projects which include the joint use of facilities will reduce both capital and operating costs, while turnkey design and build solutions will primarily reduce capital costs.

Public-private partnerships also lower costs through:

- joint development of different facilities via savings in land costs and the sharing of heating, support and other facilities (Toronto schools and recreational facilities), and
- construction of facilities by the private sector where the private partner can achieve:
  - external benefits such as reduced taxes or using the facilities as a selling tool for other land (Richmond ice centre and soccer pitch),
  - unique economies of scale in construction and operation (Alberta Highway 14 water distribution project), or
  - can offer innovative design and better co-ordination with computer systems (Nova Scotia schools).

For all public-private partnerships, the liabilities and responsibilities of each partner must be clear to avoid ongoing disagreements (Board of Education and City of Toronto), including a detailed maintenance schedule where "turnkey" facilities will eventually be returned to the public agency (Windsor tunnel).

Generally, any partnership that reduces municipal costs can potentially reduce housing costs through lower taxes. Cost savings through joint use of facilities reduce public sector costs (Toronto schools and potentially Pittsburgh Township schools and housing). Partnerships can result in reduced taxes for existing residents, but at the expense of capital costs for new residents (Scarborough public library, Waterloo Region roads).

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**Research Reports/Research Consultants:**

- *Alternative Methods of Financing Municipal Infrastructure*/based on studies by Informetrica and other workshop contributors
- *Provision of Municipal Infrastructure Through Demand Management: Guidebook and Case Studies*/CH2M Gore & Storrie
- *Public-Private Partnerships in Municipal Infrastructure*/IBI Group, Dillon Consulting Limited, The Acumen Consulting Group, Lapointe Consulting, Paterson Planning and Research Ltd.

A full report on this project is available from the Canadian Housing Information Centre at the address below.

**Housing Research at CMHC**

Under Part IX of the National Housing Act, the Government of Canada provides funds to CMHC to conduct research into the social, economic and technical aspects of housing and related fields, and to undertake the publishing and distribution of the results of this research.

This fact sheet is one of a series intended to inform you of the nature and scope of CMHC's research report.

The **Research Highlights** fact sheet is one of a wide variety of housing related publications produced by CMHC.

For a complete list of **Research Highlights**, or for more information on CMHC housing research and information, please contact:

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